A SATELLITE TRACKED DRIFTER WITH A VERTICALLY MIGRATING DROGUE FOR STUDIES OF LARVAL DISPERSAL

Potential larval dispersal is a function of time in the plankton and hydrographic regimes. This is further complicated by the interaction between environmental cues and larval responses which dictate changes in vertical distribution of the larvae within that hydrographic milieu. These changes in distribution can be ontogenetic, cyclic (diurnal or tidal) or a combination of both. The vertical distribution of the larvae is usually measured by discrete sampling over a very short time frame (Rimmer and Phillips, 1979; Rothlisberg, 1982). Because long-term, vertically-stratified sampling of larvae and known environmental stimuli are impracticable, the advection of larvae is extrapolated from these limited observations using a mean larval behaviour and a fixed circulation (Phillips and Williams, 1986) or estimated from models of both the larval behaviour and hydrographic regime (Rothlisberg *et al.*, 1983). A more direct approach to estimating dispersal pathways and potential is a device that mimics the larval behaviour in situ and can be monitored continuously, remotely and over the length of the planktonic larval life. This was the motivation for the satellite-tracked drifter with a vertically migrating drogue.

The current drifter was designed to estimate the larval dispersal of the ornate rock lobster *Panulirus ornatus*, in the northern Coral Sea and Gulf of Papua. We have used the behaviour of *P. cygnus* larvae (Rimmer and Phillips, 1979) as there have been no studies of the larval ecology of *P. ornatus*. Phyllosomes of *P. cygnus* undergo diurnal vertical migrations of 100 to 150 m, are planktonic for periods up to one year and potentially disperse over oceanic basins. The drogue has a fixed diurnal migration pattern, activated by light intensity, migrating at 10 m min^{-1}, between the surface at night and 130 m by day. The drogue is fitted with a sensor so its depth can be monitored. The drifter uses solar power to operate the winch and control electronics while the telemetry transmitter uses dry cell batteries for power. The life span of the drifter, as dictated by battery capacity, is approximately one year. The geographic position of the drifter, the depth of the drogue, surface temperature, sea state and battery voltage are transmitted 6 to 8 times per day by CLS-Argos tracking telemetry. Sea trials of the device are underway and deployment in the Gulf of Papua is planned for December 1990.

Future models of the drifter will 'react' to the environment and will be able to 'behave' more realistically. They will be programmed with taxon specific behaviour regimes and ontogenetic changes in behaviour will also be possible. An *in situ* temperature sensor will monitor the environment and control the 'growth rate' of larvae and their attendant behaviour. An *in situ* light meter will allow the drogue to follow isolumes and react to variable light intensity and penetration. An echo sounder will allow the drogue to migrate near the bottom, permitting movement through shallow water and entrance into nursery grounds.

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METABOLIC RESPONSES OF SOME ESTUARINE CRUSTACEAN LARVAE TO SALINITY VARIATION

Estuarine systems, characterised by large variations in environmental parameters, are widely recognised both as areas of high productivity and as rearing grounds for a variety of marine and freshwater crustaceans. In order to become successfully adapted to this special environment, larval crustaceans must be able to tolerate such variations, specially in salinity. Although the influence of environmental parameters on the metabolic rate of adult crustaceans has been the subject of several studies, few papers have dealt with larvae.

This paper presents data on some crustacean larvae which inhabit estuarine waters along the coast of the State of Sao Paulo, Brazil, the adults of which live in very different biotopes. The metabolic rates of these larvae were determined in different salinities (0.2, 7, 14, 21, 28 and 35 ppt) at 20°C, using Cartesian diver microrespirometers. Larvae of the oligohaline or freshwater species showed salinity independent metabolic rates over the salinity range 7–28 ppt while larvae of the mesohaline species regulate metabolism over a higher salinity range, 14–35 ppt. Larvae of the marine species (euhaline), however, regulated metabolism over the salinity range 21–35 ppt. Such results indicate that the larvae of these species, although developing in the same biotope, respond differently to salinity variations, revealing in some cases, greater metabolic regulation in the salinity range approximating that of the adult environment.

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